

Claims:

1. A synthetic middle distillate cut having less than 9 mass%, as determined according to IP 391 or ASTM D 5186 standards, aromatics content.
- 5 2. A synthetic middle distillate cut as claimed in claim 1, having less than 8.99 mass% monocyclic aromatics content.
3. A synthetic middle distillate cut as claimed in claim 1 or claim 2, having less than 0.01 mass% polycyclic aromatics.
4. A synthetic middle distillate cut as claimed in any one of the preceding claims, having an isoparaffins to n-paraffins mass ratio of between about 1:1 to about 12:1.
- 10 5. A synthetic middle distillate cut as claimed in claim 4, wherein the isoparaffins to n-paraffins mass ratio is between about 2:1 to about 6:1.
6. A synthetic middle distillate cut as claimed in claim 5, wherein the isoparaffins to n-paraffins mass ratio is 4:1.
7. A synthetic middle distillate cut as claimed in any one of the preceding claims, wherein the synthetic distillate is derived from a FT primary product.
- 15 8. A synthetic middle distillate cut comprising more than 50% isoparaffins, wherein the isoparaffins are predominantly methyl and/or ethyl and/or propyl branched.
9. A synthetic middle distillate cut as claimed in claim 8, wherein the gradient of an isoparaffins to n-paraffins mass ratio profile of the synthetic middle distillate cut increases from about 1:1 for C₈ to 8.54:1 for C₁₅ and decrease again to about 3:1 for C₁₈.
- 20 10. A synthetic middle distillate cut as claimed in claim 9, wherein a fraction of the synthetic middle distillate cut in the C₁₀ to C₁₈ carbon number range has a higher ratio of isoparaffins to n-paraffins than a C₈ to C₉ fraction of the synthetic middle distillate cut.
11. A synthetic middle distillate cut as claimed in claim 9 or claim 10, wherein the isoparaffins to n-paraffins mass ratio of the C₁₀ to C₁₈ fraction is between 1:1 and 9:1.
- 25 12. A synthetic middle distillate cut as claimed in claim 9, wherein the isoparaffins to n-paraffins mass ratio is about 8.54:1 for a C₁₅ fraction of the synthetic middle distillate cut.
13. A synthetic middle distillate cut as claimed in any one of claims 8 to 12, wherein a C₁₉ to C₂₄ fraction of the middle distillate cut has a mass ratio range of isoparaffins to n-paraffins of between 3.3:1 and 5:1, generally between 4:1 and 4.9:1.
- 30 14. A synthetic middle distillate cut as claimed in any one of claims 8 to 13, wherein the mass ratio of isoparaffins to n-paraffins is adjusted by controlling the blend ratio of hydrocracked to straight run components of the synthetic middle distillate cut.
15. A synthetic middle distillate cut as claimed in claim 14, wherein the isoparaffins to n-paraffins mass ratio of the C₁₀ to C₁₈ fraction having 30% straight run component is between 1:1 and 2.5:1.
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16. A synthetic middle distillate cut as claimed in claim 14, wherein the isoparaffins to n-paraffins mass ratio of the C₁₀ to C₁₈ fraction having 20% straight run component is between 1.5:1 and 3.5:1.
- 5 17. A synthetic middle distillate cut as claimed in claim 14, wherein the isoparaffins to n-paraffins mass ratio of the C₁₀ to C₁₈ fraction having 10% straight run component is between 2.3:1 and 4.3:1.
18. A synthetic middle distillate cut as claimed in claim 14, wherein the isoparaffins to n-paraffins mass ratio of the C₁₀ to C₁₈ fraction having substantially only a hydrocracked component is between 4:1 and 9:1.
- 10 19. A middle distillate cut as claimed in any one of claims 8 to 18, wherein at least some of the isoparaffins are methyl branched.
20. A middle distillate cut as claimed in any one of claims 8 to 19, wherein at least some of the isoparaffins are di-methyl branched.
21. A middle distillate cut as claimed in any one of claims 8 to 20, wherein at least 30% (mass) of the isoparaffins are mono-methyl branched.
- 15 22. A middle distillate cut as claimed in any one of claims 8 to 21, wherein at least some of the isoparaffins are ethyl branched.
23. A biodegradable synthetic middle distillate cut, having an aromatics content substantially as claimed in any one of claims 1 to 7.
- 20 24. A biodegradable synthetic middle distillate cut, having an isoparaffinic content substantially as claimed in any one of claims 8 to 22.
25. A biodegradable synthetic middle distillate cut, having an isoparaffinic content as claimed in claim 23 and an aromatics content as claimed in claim 24.
26. A synthetic middle distillate cut as claimed in any one of claims 8 to 25, wherein the synthetic distillate is a FT product.
- 25 27. A biodegradable diesel fuel composition including from 10% to 100% of a middle distillate cut as claimed in any one of the preceding claims.
28. A biodegradable diesel fuel composition as claimed in claim 27, including from 0 to 90% of at least one other diesel fuel.
- 30 29. A biodegradable diesel fuel composition as claimed in claim 27 or claim 28, including from 0 to 10% additives.
30. A biodegradable diesel fuel composition as claimed in any one of claims 27 to 29, wherein the additives include a lubricity improver.
31. A biodegradable diesel fuel composition as claimed in claim 30, wherein the lubricity improver comprises from 0 to 0.5% of the composition.
- 35 32. A biodegradable diesel fuel composition as claimed in claim 31, wherein the lubricity improver comprises from 0.00001% to 0.05% of the composition.

33. A biodegradable diesel fuel composition as claimed in claim 32, wherein the lubricity improver comprises from 0.008% to 0.02% of the composition.
34. A biodegradable diesel fuel composition as claimed in any one of claims 28 to 33, wherein one of the other diesel fuels is US 2-D grade diesel fuel.
- 5 35. A biodegradable diesel fuel composition as claimed in any one of claims 28 to 33, wherein one of the other diesel fuels is CARB grade diesel fuel.
36. A process for producing a readily biodegradable synthetic middle distillate, the process including:
- 10 (a) separating the products obtained from synthesis gas via the FT synthesis reaction into one or more heavier fraction and one or more lighter fraction;
- (b) catalytically processing the one or more heavier fraction under conditions which yield mainly middle distillates;
- (c) separating the middle distillate product of step (b) from the lighter product and heavier product that are also produced in step (b); and
- 15 (d) blending the middle distillate fraction obtained in step (c) with at least a portion of the one or more lighter fraction of step (a), or products thereof.
37. A process for producing a synthetic middle distillate as claimed in claim 36, wherein the catalytic processing of step (b) is a hydroprocessing step.
38. A process for producing a synthetic middle distillate as claimed in claim 36 or claim 37, including one or more additional step of fractionating at least some of the one or more lighter fraction of step (a), or products thereof, prior to step (d).
- 20 39. A process for producing a synthetic middle distillate as claimed in any one of claims 36 to 38, including the additional step of hydrotreating at least some of the one or more light fraction of step (a), or products thereof, prior to step (d).
- 35 40. A process for producing a synthetic middle distillate as claimed in any one of claims 36 to 39, wherein the one or more heavier fraction of step (a) boils above about 270°C.
41. A process for producing a synthetic middle distillate as claimed in any one of claims 36 to 40, wherein the one or more heavier fraction of step (a) boils above about 300°C.
42. A process for producing a synthetic middle distillate as claimed in any one of claims 36 to 41, wherein the one or more lighter fraction boils in the range C₅ to the boiling point of the heavier fraction.
- 30 43. A process for producing a synthetic middle distillate as claimed in any one of claims 36 to 42, wherein the one or more lighter fraction boils in the range 160°C to 270°C.
44. A process for producing a synthetic middle distillate as claimed in any one of claims 36 to 43, wherein the product of step (d) boils in the range 100°C to 400°C.
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45. A process for producing a synthetic middle distillate as claimed in any one of claims 36 to 44, wherein the product of step (d) boils in the range 160°C to 370°C.
46. A process for producing a synthetic middle distillate as claimed in any one of claims 36 to 45, wherein the product of step (d) is a diesel fuel.
- 5 47. A process for producing a synthetic middle distillate as claimed in any one of claims 36 to 46, wherein the product of step (d) is readily biodegradable.
48. A process for producing a synthetic middle distillate as claimed in any one of claims 36 to 47, wherein the product of step (d) is obtained by mixing the middle distillate fraction obtained in step (c) with at least a portion of the one or more lighter fraction of step (a), or products thereof, in a volume ratio selected to provide a diesel fuel having a required specification.
- 10 49. A process for producing a synthetic middle distillate as claimed in any one of claims 36 to 48, wherein the product of step (d) is obtained by mixing the middle distillate fraction obtained in step (c) with at least a portion of the one or more lighter fraction of step (a), or products thereof, in a volume ratio of between 1:1 and 9:1.
- 15 50. A process for producing a synthetic middle distillate as claimed in claim 49, wherein the product of step (d) is obtained by mixing the middle distillate fraction obtained in step (c) with at least a portion of the one or more lighter fraction of step (a), or products thereof, in a volume ratio of between 2:1 and 6:1.
51. A process for producing a synthetic middle distillate as claimed in claim 50, wherein the product of step (d) is obtained by mixing the middle distillate fraction obtained in step (c) with at least a portion of the one or more lighter fraction of step (a), or products thereof, in a volume ratio of 84:16.
- 20 52. A synthetic middle distillate cut, substantially as herein described and illustrated.
53. A biodegradable synthetic middle distillate cut, substantially as herein described and illustrated.
- 25 54. A biodegradable diesel fuel composition, substantially as herein described and illustrated.
55. A process for producing a readily biodegradable synthetic middle distillate, substantially as herein described and illustrated.
56. A new synthetic middle distillate cut, biodegradable synthetic middle distillate cut, biodegradable diesel fuel composition, or a new process for producing a readily biodegradable synthetic middle distillate, substantially as herein described.
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